

Patent Application

Guided Missile Having a Jettisoned Protective Cap

The invention relates to a guided missile having at its tip a seeker head which is covered by a protective cap releasable during the flight.

Guided missiles are provided with a seeker head at their tip responsive to the radiation of a tracked target. The seeker head usually has an imaging optical system imaging an object scene comprising the target onto a detector or a reticle. From the signals at the detector control signals are derived guiding the missile to the target. Towards the front the seeker head is covered by a curved window, the dome. The dome consists of a material which is transparent for the radiation to which the detector is responsive.

Missiles are accelerated to very high velocities. The dome is therefore exposed to considerable mechanical and thermal stress limiting the life time of the dome and thereby of the seeker head during the flight. Therefore it is known to cover the dome at first with a protective cap. The missile is first guided close to the target by other guidance means. Then the protective cap is pyrotechnically released freeing the dome and the seeker head and the seeker head can detect the target and guide the missile to the target. It is essential that the missile is not damaged by the releasing of the protective cap or disturbed in its path.

It is an object of the invention to provide a releaseable protective cap which can be released without impairing the missile.

According to the invention this object is achieved in that the protective cap is divided along its length in at least two parts kept together by releasable connecting means and the protective cap is form-fitting connected to the airframe only in the connected state by interlocking structures of the releasing cap and the airframe of the missile.

In a first flight phase with put-on protective cap kept together by connecting means the protective cap is form-fitted held to the airframe of the missile. This is achieved without screws or the like by interlocking structures provided at the protective cap and the airframe of the missile. These structures can be for example an inwardly projecting ledge at the airframe-side edge of the protective cap interlocking with a circumferential recess in the airframe. As long as the protective cap is held together, form-fitting connection is ensured over 360°. When the connecting means are released the longitudinally divided protective cap falls apart into several segments each extending over for example 180° or 120°. Thereby the form-fitting is no longer ensured. The pressure pushes the segments in a radial direction outwards, while the interlocking structures fall apart. The segments are jettisoned to the side.

In a preferred embodiment the protective cap is cone-shaped and divided along at least two generatrices of the cone. The connecting means are preferably pyrotechnically releasable. In order to ensure safe sideways pushing of the parts of the protective cap after the release of the connecting means preferably an opening is formed in the protective cap in such a way that pressure builds up in the interior of the protective cap before the release of the connecting means. The opening can be closed by a releasable cover the cover being released shortly before the release of the connecting means. The cover can be released by pyrotechnical means.

Embodiments of the invention are described below in greater detail with reference to the accompanying drawings.

Fig.1 is a perspective, partly sectional view of the tip of a missile with a two-part conical protective cap wherein an opening is provided in the tip of the protective cap to build up pressure within the protective cap.

Fig.2 is a perspective view of the arrangement of Fig.1 and shows the release of the connecting means and the opening of the protective cap.

Fig.3 is a perspective view similar to the one in Fig. 2 and shows the sideways jettisoning of the two parts of the protective cap.

Fig.4 is a perspective view of an alternative embodiment of a protective cap also having an opening for generating a pressure, this opening, however, being closed by a releasable cover in the form of the tip of a cone.

Fig.5 is a perspective view similar to the one in Fig.4 and illustrates the release of the tip of the cone.

Fig.6 is a perspective view of the protective cap of Fig.5 and shows the dividing of the two parts of the protective cap.

In Fig.1 numeral 10 denotes the tip of a missile. The tip 10 comprises a (non-visible) seeker head, for example an infrared seeker head. The tip 10 is closed by a dome 12, i.e. a curved window transparent for infrared radiation. A conical protective cap 14 is arranged in front of the dome 12 at the tip 10. The protective cap 14 is longitudinally divided along two diametrically opposing generatrices 16 and 18 of the cone, so that two parts 20 and 22 are formed each extending over 180°. The two parts 20 and 22 are connected by connecting means 24 which are pyrotechnically releasable. By the pyrotechnical release of the connecting means 24 the two parts 20 and 22 can be separated from each other. As can be seen from Fig.2 the connecting means 24 are divided into two halves 24A and 24B.

As long as the protective cap 14 is not divided it is form-fitted connected to the protective cap and the airframe or tip 10 of the missile by the interlocking structures. As can be seen from Fig.1 these structures consist of an inwardly projecting ledge 26 extending along the airframe-side edge of the protective cap 14 which interlocks with a circumferential recess at the edge of the tip 10 about an angle of 360°. If the protective cap 14 falls apart into two parts 20 and 22, with each of them extending only about an angle of 180° there is no form-fitting any longer. The two parts 20 and 22 are disengage from the tip 10 of the missile and are jettisoned to the side, as shown in Fig. 3.

To support the disengagement and the jettisoning to the side, an opening 28 is provided in the range of the tip of the cone. Through this opening a pressure builds up in the space within the protective cap 14 and in front of the dome 12. This pressure acts on the two parts 20 and 22 outwardly to the side. When the connecting means 24 are separated and the protective cap 14

is divided into its two parts 20 and 22 this pressure ensures that the parts 20 and 22 are quickly pushed away to the side.

Figs.4 to 6 show a different embodiment. Here, the cone-shaped protective cap 30 consists of three parts, i.e. two at the tip 32 of the missile and adjacent bowl-shaped parts 34 and 36 adding up to a section of the protective cap 30 in the shape of a truncated cone and forming an opening 38 at the front and a cone-shaped cover 40 forming the tip of the cone of the protective cap 30 and covering the opening 38 and keeping the two parts 34 and 36 together at their front edge.

As it is shown in Fig.5, at first the cover 40 is pyrotechnically blown off to jettison the protective cap 30. Thereby the opening 38 is freed. Through the opening a pressure builds up within the parts 34 and 36 trying to push the two parts apart. The parts 34 and 36 released by the cover 40 are pushed apart. The form-fitting at the rear end of the parts 34 and 36 ends so that the parts 34 and 36 are released backwards at an inclined angle.